

Claims

1. A structure used to raise persons by means of air jets, comprising a support structure (2) that supports one or more flight positions (3; 5) and respective devices (1) for generating vertical air currents or jets, each of these devices (1) being formed by at least:
  - 5 - a suction-and-delivery conduit (4), a delivery outlet of the conduit (4) being vertically arranged and ending in proximity of the respective flight position (3; 5),
    - a machine (6) for producing mechanical work, which is located inside said conduit (4), and is used to suck air from a suction inlet of said conduit (4), thereby generating a vertically upward directed air current which is discharged from the delivery outlet;
  - 10 one or more elastic membranes or nets (3) being provided at each respective flight position (3; 5) in order to support the weight of a person also in the event of its free fall from a maximum predetermined height, and said elastic membrane or net (3), arranged above a respective delivery outlet of a conduit (4), being sufficiently permeable to the air to permit the passage of the air current that raises the person;
  - 15 the said structure used to raise persons by means of air jets being characterised in that :
    - the machine (6) for producing mechanical work is a variable pitch propeller, which is driven by an electric motor;
    - an inverter is connected between the electric motor of the variable pitch propeller (6) and the electric energy supply source, said inverter being used to vary the frequency of the electric current supplied to the electric motor of the variable pitch propeller (6);
    - a balance (7) is provided, which exactly determines the weight of a person participating to the game, and electronically generates an electric signal proportional to this weight, said electric signal being used to control the inverter to modify the frequency of the electric motor input current, thereby reaching the maximum number

of rpm of the variable pitch propeller (6) for this particular person, corresponding to an air current suited to raise this person up to a maximum pre-set height.

2. A structure according to claim 1, wherein said electric signal is also used to vary  
5 the pitch of the variable pitch propeller (6), in order to be able to modify the air flow rate by the concurrent action of the inverter and of an electronic regulation system used to adjust the blade inclination of the variable pitch propeller (6).
3. A structure according to claim 2, wherein the value of said maximum preset  
10 height is comprised in the interval 2.5 – 3 metres.
4. A structure according to anyone of the preceding claims, wherein each balance (7) comprises a central unit forming a connector, the latter being connected to an alphanumeric display located inside a control room (14).  
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5. A structure according to claim 4, comprising sensors, and a decoder associated with the electric motor, wherein the sensors detect the air flow velocity, and in the event of an excessive deviation of the effective value from the nominal, or desired, air velocity value, they cause, through the inverter, a controlled slowing down of the  
20 propeller (6) angular velocity, by the adjustment of the frequency of the electric motor input current; said nominal value being for instance the value that can be determined based on the electric signal provided by the balance (7).
6. A structure according to any of the preceding claims, wherein there are provided  
25 means for storing the usage time of the various mechanical, electronic and electromechanical components of the structure, and for storing the statistical information concerning their failures or possible operation anomalies.

7. A structure according to any of the preceding claims, wherein the various flight positions (3; 5) include injury preventing means (5), which surround the elastic membranes or nets (3) that are permeable to air, and which are for instance formed by pillows of polyurethane or pillows that automatically deflate in the event of  
5 impact by a person.

8. A structure according to any of the preceding claims, wherein the various flight positions (3; 5) are distanced from each other to a sufficient degree to exclude contacts among the participants in the game; the structure comprising also spectators  
10 stands (13) with rigid or deformable parapets, which in the former case are sufficiently distanced from the flight positions to prevent impacts by the participants, even in the event of their fall.

9. A structure according to any of the preceding claims, wherein the structure is  
15 made of several modules, each of which includes various flight positions (3; 5) and respective devices (1), each module including:

- N flight positions (1; 3; 5);
- N balances (7), so that each participant will have one respective balance (7) at his disposal, in order to speed up the weighing procedure;
- 20 - a number of  $2 \times N$  boxes (12; 12'), which is twice the number of flight positions (3; 5).

10. A structure according to claim 9, wherein each module further comprises:  
- its own stands (13), which also serve as separation means between the various  
25 modules;  
- a respective control room (14), with an alphanumeric display used for monitoring the operation of the module and for the surveillance of the participants for this particular module, in order to be able to reduce for instance the air flow rate at a

certain flight position, using said regulation system, if it seems that a person feels ill or is seized by panic;

- a cash desk (10), for getting an entry ticket;
- an enveloping screen (11) used for projections in three dimensions (3D).

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11. A structure according to anyone of the preceding claims, wherein part of this structure, and in particular the devices (1) used to generate the vertical air currents, is received inside a basin made of reinforced concrete, which is laid underground, that is, which is located below the level of the surrounding soil.

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12. A structure according to anyone of the preceding claims, wherein this structure is easily disassembled and forms a structure for travelling shows or performances.

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13. A structure according to any of the preceding claims, characterised in that:  
in order to minimise stresses on the joints connecting the drive shaft of each motor to the respective variable pitch propeller (6), the said motors are never stopped in the time intervals between the various game turns, but are rotated instead at a minimum predefined rpm, say Nmin, by pre-setting in a corresponding manner, through the inverter, the frequency of the current supplied to the motor.

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14. A structure according to anyone of the preceding claims, wherein at the beginning of each game turn, after a person has "leaned" upon the vertical air flow of a flight position (3; 5), the air flow rate and consequently the air velocity in each flight position (3; 5) is progressively increased until the participant has reached a maximum flight height, which is preferably comprised between 2.5 and 3 meters; this operation being performed by gradually increasing the rpm of the propeller (6), starting from Nmin, by simultaneously varying the propeller pitch (6) and the frequency of the current through the inverter; wherein, moreover, said maximum

flight height is determined by processing the electric signal provided by said balance (7).

15. A structure according to anyone of the preceding claims, wherein at the end of  
5 each game turn the inverter progressively reduces to Nmin the rpm of the motor by  
varying the frequency of the motor supply current, thereby gradually returning the  
participant in a completely safe manner to the trampling level of the flight position  
(3; 5).